

### Totally Up Front

**Problem:** How does the ratio of masses of substances in a chemical reaction compare to the ratio of their coefficients in a balanced equation?

#### Materials

Balance  
Bunsen burner  
Ring stand & iron ring  
Evaporating dish & watch glass  
Sodium carbonate ( $\text{Na}_2\text{CO}_3$ )  
3 M HCl (hydrochloric acid)

**\*Wear safety goggles throughout the experiment. HCl is corrosive to skin and eyes.**

#### Procedure:

- 1) Read the procedure and construct a data table to include all of the required data.
- 2) Measure and record the mass of a clean, empty evaporating dish and watch glass.
- 3) Measure about 2 grams of sodium carbonate into the dish and record the mass.
- 4) Place the watch glass on the evaporating dish and using the dropper slowly add the HCl through the pour spout. Continue to add acid until the sodium carbonate has completely reacted. You do not want to add any more HCl than the minimum amount needed to react all of the sodium carbonate. You may want to gently swirl the dish as you near completion to make sure all of the HCl is used before adding more.
- 5) With the watch glass on the dish, use the Bunsen burner to dry the contents. Heat to a constant mass. Calculate the mass of the solid product and record in data table.

## Totally Up Front

Problem:

Name \_\_\_\_\_

Partner \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

### Data Table

### Summing Up

- 1) Write the balanced equation for the reaction between the sodium carbonate and the HCl.
- 2) Did a chemical reaction occur when you heated the evaporating dish? Explain. Did you burn the contents of the evaporating dish? Explain.
- 3) From their masses, determine the number of moles of  $\text{Na}_2\text{CO}_3$  and moles of NaCl. (Hint: Use Per. Table)
- 4) How does the ratio of the coefficients of  $\text{Na}_2\text{CO}_3$ :NaCl in the BCE compare to the ratio of their masses?  
\_\_\_\_\_  $\text{Na}_2\text{CO}_3$ : \_\_\_\_\_ NaCl                      \_\_\_\_\_ g  $\text{Na}_2\text{CO}_3$ : \_\_\_\_\_ g NaCl
- 5) How does the ratio of the coefficients of  $\text{Na}_2\text{CO}_3$ :NaCl compare to the ratio of their moles?  
\_\_\_\_\_  $\text{Na}_2\text{CO}_3$ : \_\_\_\_\_ NaCl                      \_\_\_\_\_ mole  $\text{Na}_2\text{CO}_3$ : \_\_\_\_\_ mole NaCl
- 6) How do you explain the differences in the ratios in #4 above compared to the ratios in #5?